CLAIMS

1. Friction clutch device including, on the one hand, a rotational drive flywheel (13) featuring a front extremity intended to be fixed to a drive shaft (11), and a rear extremity in the form of a hollow-shaped reaction plate (4) with a central recess (39) delimited externally by a friction face (37), and, on the other hand, a friction disc (20) comprising, at its outer periphery, at least one friction lining (16) for contact with the friction face (37) of the reaction plate (4), the said friction lining (16) being integral with a support (21) coupled elastically, by way of a torsion damper (20a), to a central hub (15) intended to be integrated in rotation with a driven shaft, characterised in that the torsion damper (20a) penetrates into the central recess (39) of the reaction plate (4) and in that the drive flywheel (13), between its front and rear extremities, carries the rotor (6) of a rotating electric machine (2) comprising a fixed stator (5).

2. Device according to Claim 1, characterised in that the torsion damper (20a) includes, on the one hand, a first guide washer (29) integral with the support (21) and with a second guide washer (30), and, on the other hand, a web (34) arranged between the two guide washers (29, 30), and linked in rotation, possibly after taking up play, with the hub (15), and in that the second guide washer (30) is installed in the central recess (39) of the reaction plate (4).

3. Device according to Claim 2, characterised in that the torsion damper (20a) is installed radially under a first annular portion (38) of axial orientation being connected to the inner periphery of the friction face (37).

4. Device according to Claim 3, characterised in that the first portion (38) is extended inwards by an inclined portion (142).

5. Device according to Claim 4, characterised in that the inclined portion is extended by a ring (130) of transverse orientation.

6. Device according to Claim 3, characterised in that the first portion (38) is connected to a ring of transverse orientation (130).

7. Device according to Claim 3, characterised in that the recess (39) is staircase-shaped.

8. Device according to Claim 1, characterised in that the drive flywheel (13) is in at least two parts, namely, a first part consisting of the reaction plate (4) and a second part (130, 131, 46), integral in rotation with the first part and intended to be fixed onto the drive shaft (12).

9. Device according to Claim 8, characterised in that the second part (130, 131, 46, 230) consists of a spacer intended to be interposed between the drive shaft and the reaction plate.

10. Device according to Claim 9, characterised in that the spacer (130, 131, 46) has an overall U-shaped cross section with an upper branch (46) of axial orientation, overall in the form of a sleeve with an end shoulder (48) for fixing to the rotor (6) of the electric machine (2), and an annular lower branch (131) of axial orientation for fixing to the reaction plate (4).

11. Device according to Claim 9, characterised in that the spacer (230) consists of a shaft.

12. Device according to Claim 8, characterised in that the second part consists of a shaft splined at its rear extremity for linking in rotation with the reaction plate (4).

13. Device according to Claim 8, characterised in that the second part consists of a pedestal splined internally for linking in rotation with a central shaft (430) coming from the reaction plate (4).

14. Device according to Claim 8, characterised in that the second part consists of a flange (431a) linked

in rotation with a central shaft (430a) coming from the reaction plate (4).

15. Device according to Claim 14, characterised in that the flange (431a) centrally features a hub (431b) with an internal bore of frustoconical shape for mounting on the outer periphery of the shaft (430a) of frustoconical shape.

16. Device according to Claim 14, characterised in that the flange (431a), at its outer periphery, carries a sleeve with an end shoulder (48) for fixing to the rotor (6) of the electric machine (2).

17. Device according to Claim 1, characterised in that the drive flywheel (13) carries bearing means (132) interposed radially between the said flywheel (13) and a carrier piece (134) integral with the stator (5) for defining a precise gap between the stator (5) and the rotor (6).

18. Device according to Claim 17, characterised in that the bearing means (132) are installed radially above elements (145) for fixing the drive flywheel (13) to the drive shaft (11).

19. Device according to Claim 18, characterised in that the bearing means (132) are carried at their inner periphery by a spacer (130, 46, 131) belonging to the flywheel (13) and integral with the reaction plate (4) for forming a spacer between the reaction plate (4) and the drive shaft (11).

20. Device according to Claim 18, characterised in that the bearing means (132) are carried at their outer periphery by a sleeve (46) integral with the reaction plate (4) and at their inner periphery by a skirt (133) integral with a carrier piece (134) carrying the stator (5) at its outer periphery.

21. Device according to Claim 17, characterised in that the bearing means (132) are installed on the same circumference as the elements (245) for fixing the drive flywheel (13) to the drive shaft (11).

22. Device according to Claim 17, characterised in that the bearing means (132) are installed radially below elements (345) for fixing the drive flywheel (13) to the drive shaft (11).

23. Device according to Claim 22, characterised in that the carrier piece is provided with through-holes (545), for at least one tool for screwing the fixing elements (345), consisting of screws, to pass through.

24. Device according to Claim 23, characterised in that the reaction plate (4) features through-holes in axial coincidence with the through-holes (545) of the carrier piece.

25. Device according to Claim 17, characterised in that the carrier piece (134) is integral with a spacer (61) and internally carries elastic means (462, 463) which can be deformed in order for elements (64), for fixing and flexible mounting of the carrier piece (134) onto the engine block (62) of the internal-combustion engine, to pass through.

26. Device according to Claim 1, characterised in that the engine flywheel (13) carries clearance means for chignons (8) which the stator (5) of the electric machine (2) features in axial projection.

27. Device according to Claim 17, characterised in that the carrier piece (134) features clearance means for chignons (8) which the stator (5) of the electric machine (2) features in axial projection.

28. Device according to Claim 1, characterised in that the engine flywheel (31) carries cooling means for cooling the electric machine.

29. Device according to Claim 28, characterised in that the cooling means consist of fins (1200, 1201, 1202, 1206) carried by one of the elements of the reaction plate (4)/rotor (6).

30. Device according to Claim 1, characterised in that the stator (5) of the electric machine (2) carries cooling means.

31. Device according to Claim 30, characterised in that the cooling means consist of piercings formed in the pack of metal plates (10) which the stator (5) features, the said piercings making it possible to transport a heat-carrying fluid from one face to the other.

32. Device according to Claim 30, characterised in that the stator (5) is integral with a spacer (61) carrying an air inlet (1208) and an air outlet (127).

33. Device according to Claim 1, characterised in that the reaction plate, at its outer periphery, features an annular skirt (144) surrounding the friction lining or linings (16) of the friction disc (20) and in that the annular skirt (144), at its inner periphery, features a groove (148) for catching the dust.

34. Device according to Claim 20, characterised in that the reaction plate (4) includes a sleeve (46) carrying the rotor (6) of the electric machine (2).

35. Device according to Claim 1, characterised in that the drive flywheel (13) locally features removal of material (1000) for dynamic balancing of the friction-clutch device.

36. Device according to Claim 1, characterised in that the drive flywheel (13) locally features additions of material for dynamic balancing of the friction-clutch device.

37. Device according to Claim 1, characterised in that the reaction plate (4) features tappings for mounting a removable plate (3000) equipped with at least one gauge rod (3001) penetrating, with centring, into a hole (3002) formed in a pack of metal plates (10) which the stator (5) features.

38. Device according to Claim 37, characterised in that the plate (3000) carries shims (3007) intended to be interposed between the stator (5) and the rotor (6) for defining a gap (7).

39. Device according to Claim 1, characterised in that the reaction plate (4), at its outer periphery,

features a toothed crown ring intended be associated with at least one sensor.

40. Device according to Claim 1, characterised in that the reaction plate (4) carries a cover (19) on which is mounted, so as to pivot, a diaphragm (18, 22) bearing on the cover (19) for acting on a reaction plate (17) and clamping of the friction lining (16) between the pressure plates (17) and the reaction plate (4), the said pressure plate being integral in rotation with the said cover (19) while being able to be moved axially with respect to it.

41. Device according to Claim 40, characterised in that a declutching release bearing (23) is intended to act on the inner extremities of the fingers (22) which the diaphragm features centrally and in that the declutching release bearing belongs to a declutching device (24) of the concentric type.

42. Device according to Claim 41, characterised in that the declutching device (24) of the concentric type includes a piston (241) mounted so that it can move within a blind annular cavity (243) of axial orientation for forming a variable-volume chamber, and in that the piston (241) carries the declutching release bearing (23) and in that the blind annular cavity (243) is delimited by an outer body (242), in that a pre-load spring (244) acts between the outer body (242) and the declutching release bearing (23), and in that a force sensor (2000) is associated with the pre-load spring (244).

43. Device according to Claim 42, characterised in that the position sensor is placed between the pre-load spring (244) and the outer body (242).

44. Device according to Claim 41, characterised in that the declutching device of the concentric type is manoeuvred by an electric-motor actuator linked to a computer receiving information originating from sensors detecting the speed of rotation of the drive shaft (11) and of the driven shaft (12), and in that the sensor of

the speed of rotation of the drive shaft is used to detect the speed of rotation of the rotor (6) of the electric machine.

45. Device according to Claim 40, characterised in that it includes a wear-take-up device for compensating for at least the wear of the said friction lining.